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Notice of Allowability	Application No.	Applicant(s)	
	10/730,571	ORLIN, DAVID J.	
	Examiner	Art Unit	
	Leon Flores	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *5/25/2007*.

2. ☒ The allowed claim(s) is/are *1,4-8,11-15 and 18-21*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the further limitation of, *"wherein said forming includes applying weights to the main beam samples to reduce sidelobe levels of the main beam"* must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Albert J. Fasulo, II (Reg. No. 43,607) on 6/13/2007.

In the claims:

Claim 1, line 7, 'plurality of sensor' has been changed to ---plurality of sensor signals---.

Claim 1, line 8, 'sensor signal that are combined into signal pairs' has been changed to ---sensor signals that are combined into the signal pairs---.

Claim 1, line10, 'signal in a pair' has been changed to ---signal in a pair of the signal pairs---.

Claim 8, line 8, 'sensor signal that are combined into signal pairs' has been changed to ---sensor signals that are combined into the signal pairs---.

Claim 8, line10, 'signal in a pair' has been changed to ---signal in a pair of the signal pairs---.

Claim 10, line 12, 'sensor signal that are combined into signal pairs' has been changed to ---sensor signals that are combined into the signal pairs---.

Claim 10, line15, 'signal in a pair' has been changed to ---signal in a pair of the signal pairs---.

Allowable Subject Matter

2. Claims (1, 4-8, 11-15, 18-21) are allowed.

3. The following is an examiner's statement of reasons for allowance: The art of record does not suggest the respective claim combinations together and nor would the respective claim combinations be obvious with:

4. Re claim 1, the further limitation of, *"a method of suppressing side lobe interference in a beamforming process, the method comprising: receiving a plurality of sensor signals comprising elemental data; forming a main beam comprised of main beam samples using all of the sensor signals, wherein said forming includes applying weights to the main beam samples to reduce sidelobe levels of the main beam; combining a small subset of the plurality of sensor signals into signal pairs, wherein the small subset of the plurality of sensor signals that are combined into the signal pairs comprise signals from sensors that are adjacently located near the edges of the array; calculating a complex weighting factor for each signal in a pair of the signal pairs such that the maximum response axis of the resulting signal pair combination is aligned with the maximum response axis of the main beam; assigning opposite amplitudes to each signal in the pair to produce delta-channel auxiliary signals having zero response along the maximum response axis; computing a covariance matrix, M, using the delta-channel auxiliary signals, wherein each member of the covariance matrix, M, is an estimate of the covariance between two delta-channel auxiliary signals such that the whole matrix contains estimates of every possible delta-channel auxiliary signal combination and the main diagonal of the covariance matrix contains the variance of the corresponding*

delta-channel auxiliary signal; computing a cross-covariance vector, A, using the delta-channel auxiliary signals and the main beam; computing a vector of delta-channel auxiliary signal weights; multiplying each sample from each delta-channel auxiliary signal by its corresponding weight to yield weighted delta-channel auxiliary signals; summing the weighted delta-channel auxiliary signals to obtain suppressor channel samples; and subtracting the suppressor channel samples from the main beam samples to obtain an interference-free main beam". Claims 4-6 depend on claim 1 above.

5. Re claim 8, the further limitation of, "a system for suppressing side lobe interference in a beamforming process, the system comprising: means for receiving a plurality of sensor signals comprising elemental data; means for forming a main beam comprised of main beam samples using all of the sensor signals, wherein said forming includes applying weights to the main beam samples to reduce sidelobe levels of the main beam; means for combining a small subset of the plurality of sensor signals into signal pairs~ wherein the small subset of the plurality of sensor signals that are combined into the signal pairs comprise signals from sensors that are adjacently located near the edges of the array; means for calculating a complex weighting factor for each signal in a pair of the signal pairs such that the maximum response axis of the resulting signal pair combination is aligned with the maximum response axis of the main beam; means for assigning opposite amplitudes to each signal in the pair to produce delta-channel auxiliary signals having zero response along the maximum response axis; means for computing a covariance matrix, M, using the delta-channel auxiliary signals, wherein each member of the covariance matrix, M, is an estimate of the covariance

between two delta-channel auxiliary signals such that the whole matrix contains estimates of every possible delta-channel auxiliary signal combination and the main diagonal of the covariance matrix contains the variance of the corresponding delta-channel auxiliary signal; means for computing a cross-covariance vector, A, using the delta-channel auxiliary signals and the main beam; means for computing a vector of delta-channel auxiliary signal weights; means for multiplying each sample from each delta-channel auxiliary signal by its corresponding weight to yield weighted delta-channel auxiliary signals; means for summing the weighted delta-channel auxiliary signals to obtain suppressor channel samples; and means for subtracting the suppressor channel samples from the main beam samples to obtain an interference-free main beam". Claims 11-14 depends on claim 8 above.

6. Re claim 15, the further limitation of, *"a system for suppressing side lobe interference in a beamforming process comprising: a processor readable storage medium; code recorded in the processor readable storage medium to receive a plurality of sensor signals comprising elemental data; code recorded in the processor readable storage medium to form a main beam comprised of main beam samples using all of the sensor signals, wherein said forming includes applying weights to the main beam samples to reduce sidelobe levels of the main beam; code reorded recorded in the processor readable storage medium to combine a small subset of the plurality of sensor signals into signal pairs, wherein the small subset of the plurality of sensor signals that are combined into the signal pairs comprise signals from sensors that are adjacently located near the edges of the array; code recorded in the processor readable storage*

medium to calculate a complex weighting factor for each signal in a pair of the signal pairs such that the maximum response axis of the resulting signal pair combination is aligned with the maximum response axis of the main beam; code recorded in the processor readable storage medium to assign opposite amplitudes to each signal in the pair to produce delta-channel auxiliary signals having zero response along the maximum response axis; code recorded in the processor readable storage medium to compute a covariance matrix, M, using the delta-channel auxiliary signals, wherein each member of the covariance matrix, M, is an estimate of the covariance between two delta-channel auxiliary signals such that the whole matrix contains estimates of every possible delta-channel auxiliary signal combination and the main diagonal of the covariance matrix contains the variance of the corresponding delta-channel auxiliary signal; code recorded in the processor readable storage medium to compute a cross-covariance vector, A, using the delta-channel auxiliary signals and the main beam; code recorded in the processor readable storage medium to compute a vector of delta-channel auxiliary signal weights; code recorded in the processor readable storage medium to multiply each sample from each delta-channel auxiliary signal by its corresponding weight to yield weighted delta-channel auxiliary signals; code recorded in the processor readable storage medium to sum the weighted delta-channel auxiliary signals to obtain suppressor channel samples; and code recorded in the processor readable storage medium to subtract the suppressor channel samples from the main beam samples to obtain an interference-free main beam". Claims 18-21 depend on claim 15 above.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leon Flores whose telephone number is 571-270-1201. The examiner can normally be reached on Mon-Fri 7-5pm Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

LF
June 18, 2007

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